



Loughs Agency

Science Strategic Plan





Contents

Who are the Loughs Agency?	1
Mission Statement.....	1
Objective of the Loughs Agency Science Strategic Plan.....	2
What will the Strategic Plan do?.....	2
Core responsibilities	2
Timescale.....	3
Delivery	3
Stakeholders	4
Legislative Drivers and Policy Context	4
Implementation of the Strategy	7
Trout / sea trout (<i>Salmo trutta</i>).....	9
European eel (<i>Anguilla anguilla</i>)	11
Coarse Fish.....	12
Species of conservation and biodiversity interest	13
European flat oyster (<i>Ostrea edulis</i>)	14
Seed Mussel (<i>Mytilis edulis</i>).....	16
Marine Tourism	17
Habitat Quality	18
Water Quality	19
Existing Research	21
Conclusion	23



List of Figures and Table

Figure 1.	Loughs Agency Areas of Jurisdiction.....	1
Table 1.	Natural resources.....	3
Table 2.	List of resources for which secondary legislation is being sought...	3
Table 3.	Data / Activity for Atlantic salmon and trout / sea trout.....	10
Table 4.	Data / Activity for European eel.....	12
Table 5.	Data / Activity for Coarse fish.....	13
Table 6.	Data / Activity for species of conservation and biodiversity interest	14
Table 7.	Data / Activity for the European flat oyster.....	16
Table 8.	Data / Activity for seed mussel.....	17
Table 9.	Data / Activity for Marine Tourism.....	18
Table 10.	Data / Activity for water quality.....	19
Table 11.	Data / Activity for habitat quality.....	20
Table 12.	IBIS PhD research projects	21
Table 13.	IBIS Masters research projects	22

Who are the Loughs Agency?

The Loughs Agency was established as one of the cross-border bodies under the 1998 British-Irish Agreement. Its functions are as follows:

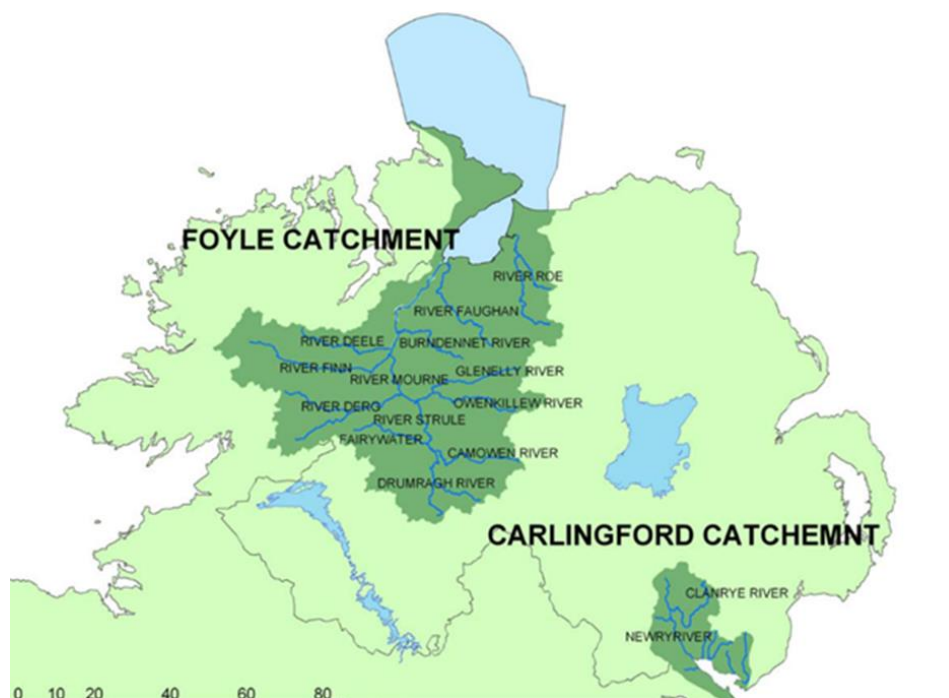
- The promotion of development of Lough Foyle and Carlingford Lough (Fig. 1) for commercial and recreational purposes in respect of marine, fishery and aquaculture matters;
- The management, conservation, protection, improvement and development of inland fisheries of the Foyle and Carlingford Areas;
- The development and licensing of Aquaculture;
- The development of marine tourism.



Mission Statement

The Loughs Agency aims to provide sustainable social, economic and environmental benefits through the effective conservation, protection, management, promotion and development of the fisheries and marine resources of the Foyle and Carlingford Areas.

Figure 1. Loughs Agency areas of responsibility





Objective of the Loughs Agency Science Strategic Plan

The objective of this Plan is to support the delivery of the Loughs Agency functions through the effective provision of scientific data, research, monitoring, and advice to underpin policy and management decisions the Agency will make to 2021. We aim to place the Agency at the forefront of scientific excellence, and to disseminate this work to the wider public.

What will the Strategic Plan do?

This Loughs Agency Science Strategic Plan will:

- Outline the legislative drivers and primary policy needs within the Loughs Agency - related to conservation, protection and development of the natural resources of the Foyle and Carlingford areas
- Develop scientific programmes to facilitate implementation of these while identifying knowledge gaps;
- Describe delivery mechanisms for scientific data, research, monitoring, and advice; and
- Produce integrated action plans which will be reviewed every three years.

The Plan will operate within the context of wider EU Legislation and national policy objectives.

Core responsibilities

The Loughs Agency's core responsibilities, under the Foyle Fisheries Act 1952 as amended, lie with conserving, protecting and developing the natural resources of the Foyle and Carlingford Areas, these are detailed in Table 1 and responsibility for the protection of water quality within the Foyle and Carlingford catchments. The Agency also has primary legislation in place for the development of Aquaculture but is seeking secondary legislation to enable the sustainable development of these resources (Table 2). This Plan will be reviewed as and when this is introduced. The Agency will also review and where appropriate implement the research findings of the Integrated Aquatic Resource Management Between Ireland, N Ireland and Scotland (IBIS) for further details please see www.loughs-agency.org/ibis.

Table 1. Natural Resources

Natural Resource	What it is used for
Atlantic salmon (<i>Salmo salar</i>)	Angling
	Commercial
Trout and sea trout (<i>Salmo trutta</i>)	Angling
	Commercial
Eels (<i>Anguilla Anguilla</i>)	Protected
Coarse fish	Angling
Native oyster (<i>Ostrea edulis</i>)	Commercial
Other species of biodiversity interest e.g. smelt (<i>Osmerus eperlanus</i>), lamprey spp. Lamprey spp. (<i>Petromyzon marinus</i> , <i>Lampetra fluviatilis</i> , <i>Lampetra planeri</i>), Arctic charr (<i>Salvelinus alpinus</i>)	Conservation / biodiversity
Habitat Quality	All stakeholders
Water Quality	All stakeholders

Table 2. List of resources for which secondary legislation is being sought

Sea bass (<i>Dicentrarchus labrax</i>)
Tope (<i>Galeorhinus galeus</i>)
Intertidal shellfish harvesting
Freshwater and marine aquaculture


Timescale

This Strategy will align with the WaterFramework Directive reporting cycle and will be in place to 2021.

Delivery

The Senior Biologist of the Loughs Agency is leading the Strategy development and implementation with advice and input from Agency staff. The Loughs Agency Scientific Advisors are providing independent oversight of the process. The Strategy will inform the Loughs Agency Corporate and Business Plans and support the Loughs Agency Development Directorate Strategic Plan.

The Science Strategy is based on the Agency's core responsibilities and is dependent on available resources within the current and projected financial constraints.



To deliver the specific elements of the Strategy the Agency will develop a series of Action Plans over its lifetime. We will continue to work closely with parent Departments, Department of Agriculture, Environment and Rural Affairs (DAERA) / Department of Communications, Climate Action & Environment (DCCAE) and Marine Institute / Agri-Food and Biosciences Institute (AFBI), Scientific Advisors and build on established relationships with sister organisations in both jurisdictions in doing this. The Loughs Agency Advisory Forum will play a vital role in supporting its implementation while the Agency will continue to develop links with other institutions, NGO's, and stakeholders to develop citizen science. We will also aim to continue and establish new partnerships to seek external funding such as IBIS (Integrated Aquatic Resource Management between Ireland, N Ireland and Scotland - www.loughs-agency.org/ibis), which delivered over 70 years of research and essential training to staff through a series of collaborative academic research projects (PhDs and MScs) between 2011 and 2015. Fundamental to the implementation and successful delivery of the Strategy are the staff of the Loughs Agency and the Agency will ensure that the high standards they have set over many years are supported, recognised and nurtured through ongoing staff development and training.

Stakeholders


The staff and Board of the Foyle, Carlingford and Irish Lights Commission will implement this plan on behalf of the stakeholders i.e. inhabitants and users of the natural resources of the Foyle and Carlingford Areas such as commercial and recreational fishers, and anyone who has an interest in the aquatic environment, consulting specifically with the Loughs Agency Advisory Forum. Stakeholders also include the two sponsoring government departments in Ireland Department of Communications, Climate Action & Environment (DCCAE) and the UK – Department of Agriculture Environment and Rural Affairs (DAERA).

Legislative Drivers and Policy Context

Foyle and Carlingford Areas

The Agency's work is primarily directed by the Foyle Fisheries Act (NI) 1952 as (amended), the Foyle Fisheries Act 1952 (as amended), the North/South Co-operation (Implementation Bodies) (NI) Order 1999 and the Foyle and Carlingford Fisheries Bill / Act in 2007. The Fisheries (Northern Ireland) 1966 and the 1959 Fisheries Consolidation Act and subsidiary Regulations made under section 13 of the Foyle Acts. In addition the Agency enforces The Water (Northern Ireland) Order 1999 and the Water Pollution Acts, 1977 and 1990 and regulations made thereunder within the Foyle and Carlingford Areas.


The Agency is one of six cross-border bodies but is the only one with a research, licencing / enforcement remit. The Agency's responsibilities include Atlantic salmon and Inland Fisheries, Marine Tourism, recreational angling, Shellfish and Aquaculture



in the two shared cross-border catchments. Secondary legislation to allow licensing and management of Aquaculture is awaited.

In addition to Agency specific legislation, wider EU and international drivers have influenced how the Agency has moved forward:

- Habitats Directive - Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
- The Water Framework Directive (WFD) - Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy
- The Marine Strategy Framework Directive (MSFD - Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) (Text with EEA relevance)
- NI Marine Act
- Marine Spatial Planning Directive - Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning
- Strategic Environmental Assessment (SEA) - Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment
- Infrastructure for Spatial Information in the European Community (INSPIRE) - Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)
- Birds Directive - Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
- Invasive Alien Species Regulation - Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species
- Eel Regulation - Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel
- Going for Growth
- Harnessing our Ocean Wealth: An Integrated Marine Plan for Ireland
- NI Biodiversity Strategy
- International Union for the Conservation of Nature (IUCN)
- North Atlantic Salmon Conservation Organisation (NASCO)
- International Council for the Exploration of the Sea (ICES)
- International Atlantic salmon Research Board (IASRB)
- Convention on International Trade in Endangered Species (CITES)



The Agency sees a continuing role in facilitating both jurisdictions in implementing key decisions with regard to international agreements, EU Directives / Regulations and in smoothing the transition of the UK from the EU. The Loughs Agency will continue to build for the future and aid in providing Science to inform decision making in the Foyle and Carlingford Areas.

UK and Northern Ireland

In 2009 the UK published High Level Marine Objectives which were:

- Achieving a sustainable marine economy;
- Ensuring a strong healthy and just society;
- Living within environmental limits;
- Promoting good governance; and
- Using sound science responsibly.

Following this the 2010 UK Marine Science Strategy which included Northern Ireland identified three high level science priorities:


- Understanding how the marine ecosystem functions
- Responding to climate change and its interaction with the marine environment
- Sustaining and increasing ecosystem benefits.

Complementing the UK Marine and Coastal Access Act, 2009, is the Northern Ireland Marine Act 2013, which will allow implementation of new management measures like Marine Conservation Zones in Northern Ireland waters. The Marine Act 2013 also enables the development of a Marine Plan for the sustainable use of NI waters. The Loughs Agency will continue to contribute to these processes as well as provide input and support to the NI Marine Science Strategy which is currently in development and to the N Ireland Integrated Marine Co-ordination Group (IMCG).

Ireland

In July 2012 the Irish Government published *Harnessing Our Ocean Wealth: An Integrated Marine Plan for Ireland (IMP)*. This set out a roadmap including high-level goals and integrated actions across policy, governance and business to enable Ireland's marine potential to be realised. The vision statement included in the document was

'Our ocean wealth will be a key element of our economic recovery and sustainable growth, generating benefits for all our citizens, supported by coherent policy, planning and regulation, and managed in an integrated manner'. The marine environment is very much seen as a national asset offering significant potential for marine enterprises / sectors and needs to be protected, managed and developed for and by the Irish citizens.



There are three high-level goals in the IMP, of equal importance, based on the concept of sustainable development:

- Focuses on a thriving maritime economy, whereby Ireland harnesses the market opportunities to achieve economic recovery and social inclusive, sustainable growth.
- Sets out to achieve healthy ecosystems that provide monetary and non-monetary goods and services (e.g. food, climate, health and well-being).
- Aims to increase engagement with the sea. Building on Ireland's rich maritime heritage, the goal is to strengthen maritime identity and increase awareness of the value (market and non-market), opportunities and social benefits of engaging with the sea.

Implementation of the Strategy

The Loughs Agency will aid in the delivery of the above marine and freshwater objectives through its Corporate and Business plans while the Loughs Agency Science Strategy will provide support through the provision of high quality information to inform management decisions and policy development.

In the following section the Strategy is aligned by each natural resource, outlining the programmes and supports to the national and international legislation including future research to address present gaps in knowledge.

Atlantic salmon (*Salmo salar*)

Objectives

- Support the development and management of sustainable Atlantic salmon fisheries, this will be achieved by:
 - Provision of supporting science for existing regulations and support the introduction and development of new regulations and management practices
 - Further development and review of scientific and fishery management reference points and provision of scientific advice on attainment of conservation limits and management targets through:
 - ❖ An annual review of stock status and report which will provide:
 - Annual stock assessment advice and forecasts. To support this data will be collected annually and quality assured
 - ❖ Review Loughs Agency salmon management strategy
 - Investigate bottlenecks to production
 - Investigate Rivers Faughan and Finn as index sites for the Foyle

- Analyse multi-decadal trends in salmonid abundance and links to environmental and habitat changes including climate change
 - Monitor macroinvertebrates and water chemistry in relation to maintaining good habitat quality for salmonid production
 - Conduct Habitat impacts, Invasive Alien Species and Barriers to Migration (HIB's) projects to develop habitat improvements / programmes of measures these should take into account wider landuse management issues such as forestry, land use practices etc.
 - Support Loughs Agency permitting processes
 - Produce catchment status reports
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management.
-
- Develop internal and external access
 - Continue to support international research and management
 - Investigate the development of appropriate data management systems for high resolution field data
 - Review IBIS projects and implement findings where appropriate
 - Continue and maintain development of new genetic techniques such as eDNA
 - Under take hydro guidelines review and to consider other types of abstraction within the lifetime of the strategy
 - Use science to monitor fish product dealers e.g. through the use of DNA
 - Keep a watching brief on potential harmful effects of salmon farming and other aquaculture practices
 - Invest in structure of existing fish counters and Investigate use of potential new technology



Trout / sea trout (*Salmo trutta*)

Objectives

- Support the development and management of sustainable Sea trout fisheries
 - Provide supporting science for existing regulations and support the introduction and development of new regulations and management practices
 - Undertake annual review of stock status
 - Investigate the establishment of biological reference points
 - Analysis of multi-decadal trends in abundance and links to environmental and habitat changes including climate change
 - Monitor macro invertebrates and water chemistry in relation to maintaining good habitat quality for salmonid production
 - Conduct Habitat impacts, Invasive Alien Species and Barriers to Migration (HIB's) project to develop habitat improvements / programmes of measures
 - Draft action plan on use of small streams in sea trout production
 - Continue and maintain development of new genetic techniques such as eDNA
 - Produce catchment status reports
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access
 - Continue to support international research and management
 - Investigate the development of appropriate data management systems for high resolution field data
 - Review IBIS projects and implement findings where appropriate
 - Review Loughs Agency trout strategy and support its implementation
 - Analysis of outcomes of Celtic Sea Trout Programme

Policy Context

- WFD
- Habitats Directive
- NASCO
- Loughs Agency Legislation
- Loughs Agency Trout Strategy
- Loughs Agency Biodiversity Strategy

The following table outlines the current status of the Loughs Agency scientific monitoring with regards to salmonids and future requirements.

Table 3. Data / Activity for Atlantic salmon and trout / sea trout

Data / Activity	Current Status	Future Requirement
Redd counting	Annual survey	Maintain existing programme
Annual semi-quantitative electrofishing	Target 500 sites annually	Maintain existing programme as minimum Calibrate to determine optimum number of sites required
Fully quantitative electrofishing assessment	As required for annual projects	Maintain as required
WFD stock assessment	Annual survey	Maintain as required
Smolt migration studies	Acoustically tagged salmon smolts, highlighted potential issues of mortality in early marine environment.	Further investigations required Including acoustic and other tagging methods to include salmon and sea trout
Fish counter programme	Four strategic counters	Rationalise counter programme Ensure regular validation Maximise value from the data
Angling exploitation	9,123 licences (2014), 15% returns	Optimise returns to maximise value from the data
Impact of catch and release	Levels of catch and release have been estimated	Refine estimates and investigate impact on stocks
Tagging on migration as kelts	None to date	Pilot programme to satellite tag a number of kelts
Biological characteristics e.g. age, sex ratios, fecundity, growth, age of maturity	Historical data available	Review current characteristics and where appropriate update and develop time series of biological characteristics for adults and juveniles
Biological reference points	Applied through regulations	Review and update where appropriate
Macroinvertebrate monitoring	80 sites bi-annually	Maintain existing programme
Water chemistry	80 sites monthly during summer field season	Maintain existing programme
Catchment Status Reports	2 annual reports	Maintain existing programme

Water Quality Status Reports	2 annual reports	Maintain existing programme
IBIS	Field work complete, writing up ongoing	Review and implement findings where appropriate
GIS Data Management	All spatial organised data input to GIS	Maintain existing programme and seek to expand real time data collection and management

European eel (*Anguilla anguilla*)

Objectives

- Support the implementation of management plans for European eel
 - Provide supporting science for existing regulations and support the introduction and development of new regulations and management practices
 - Support assessment of glass eel annual recruitment
 - Investigate potential barriers to migration and solutions
 - Review IBIS projects and implement findings where appropriate
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access
 - Investigate the development of appropriate data management systems for high resolution field data

Policy Context

- WFD
- EU Eel Regulation
- Loughs Agency Legislation

The following table outlines the current status of the Loughs Agency scientific monitoring with regards to eels and future requirements.

Table 4. Data / Activity for European eel

Data/Activity	Current status	Future requirement
Glass eel recruitment	Annual survey	Maintain existing programme
Yellow eel stock assessment	IBIS monitoring programme complete	Maintain monitoring programme
Silver eel escapement	IBIS monitoring programme complete	Maintain monitoring programme
Barriers to migration	Ongoing	Maintain existing programme
GIS Data Management	All spatially organised data input to GIS	Maintain existing programme

Coarse Fish

Objectives

- Support the development and management of coarse fisheries
 - Provide supporting science for existing regulations and support the introduction and development of new regulations and management practices
 - Assess coarse fish potential of the Loughs Agency Area over the lifetime of the strategy
 - ❖ Undertake assessment of 2 coarse fisheries annually
 - ❖ Investigate bottlenecks to production
 - ❖ Investigate enhancement strategies for coarse fish
 - ❖ Investigate the development of fishery management reference points
 - Investigate the development of appropriate data management systems for high resolution field data
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access
 - Undertake a review and develop a policy for pike (*Esox Lucius*) and pike fisheries

The following table outlines the current status of the Loughs Agency scientific monitoring with regards to salmonids and future requirements.



Table 5. Data / Activity for Coarse fish

Data/Activity	Current status	Future requirement
Still water stock assessments	2 sites surveyed annually	Maintain existing programme
Investigate bottlenecks to production	Not in place	Create programme
Investigate enhancement strategies	Not in place	Create programme
Investigate fishery management reference points	Not in place	Create programme
GIS Data Management	All spatially organised data input to GIS	Maintain existing programme

Policy Context

- WFD
- Loughs Agency Legislation

Species of conservation and biodiversity interest

Objectives

- Contribute towards monitoring and reporting of species of conservation and biodiversity interest
 - Provide supporting science
 - Review IBIS projects and implement findings where appropriate
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access

Policy context

- Habitats Directive
- MSFD
- NI Biodiversity Strategy
- Loughs Agency Biodiversity Strategy
- Loughs Agency Development Strategic Plan
- Loughs Agency Legislation

The following table outlines the current status of the Loughs Agency scientific monitoring with regards to species of conservation and biodiversity interest and future requirements.

Table 6. Data / Activity for species of conservation and biodiversity interest

Data / Activity	Current Status	Future Requirement
Arctic charr (<i>Salvelinus alpinus</i>)	Ongoing surveys	Maintain existing programme
European smelt (<i>Osmerus eperlanus</i>)	Ongoing surveys	Maintain existing programme
Lamprey spp. (<i>Petromyzon marinus</i> , <i>Lampetra fluviatilis</i> , <i>Lampetra planeri</i>)	Ongoing surveys	Maintain existing programme

European flat oyster (*Ostrea edulis*)

Objectives

- Support the development and management of the native oyster fishery in Lough Foyle by:
 - Provide supporting science for existing regulations and support the introduction and development of new regulations and management practices
 - Delivery of a carrying capacity model for shellfish production
 - Review of stock status
 - ❖ Provide stock assessment advice and forecasts bi-annually
 - Collect data required to enable this to be undertaken
 - Quality assure these data
 - Delivery of an annual spawning survey
 - Investigate the designation of a closed area to fishing in the lough for broodstock protection and regeneration
 - Investigate potential for habitat enhancement
 - Investigate bottlenecks to production
 - Investigate use of genetics for management
 - Compile annual catch statistics
 - Ecological monitoring
 - Produce Annual Status Report for the sea loughs
 - Review of Strategic Environmental Assessment (SEA) recommendations
 - Review IBIS projects and implement findings where appropriate

- All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access
- Investigate the development of appropriate data management systems for high resolution field data

Policy Context

- WFD
- Habitats Directive
- MSFD
- NI Biodiversity Strategy
- Loughs Agency Biodiversity Strategy
- Loughs Agency Legislation



The following table outlines the current status of the Loughs Agency scientific monitoring with regards to the European flat oyster and future requirements.

Table 7. Data / Activity for European flat oyster

Data / Activity	Current Status	Future Requirement
Pre-fishery assessment	Annual autumn survey	Maintain existing programme as minimum
Post-fishery assessment	Annual spring survey	Maintain existing programme as minimum
Carrying capacity	Ongoing	To deliver by March 2016
Annual spawning survey	Annual summer survey	Maintain existing programme as minimum
Landings data	Compile annual catch statistics – March annually	Maintain existing programme
Water / environmental parameters	Monthly monitoring	Maintain existing programme as minimum
Status Reports	Annual Report	Maintain existing programme
Strategic Environmental Assessment	Annual Review	Maintain existing programme
GIS Data Management	All spatial data input to GIS	Maintain existing programme

Seed Mussel (*Mytilus edulis*)

Objectives

- Support all island objectives of seed mussel exploitation and management
 - Undertake annual seed mussel surveys in
 - Lough Foyle
 - Carlingford Lough
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access
 - Review IBIS projects and implement findings where appropriate

Policy Context

- WFD
- Shellfish Waters Directive
- Loughs Agency Legislation
- MSFD

The following table outlines the current status of the Loughs Agency scientific monitoring with regards to seed mussel and future requirements.

Table 8. Data / Activity for seed mussel

Data / Activity	Current Status	Future Requirement
Fishery assessment – Lough Foyle	Annual survey	Maintain existing programme
Fishery assessment – Carlingford Lough	Annual survey	Maintain existing programme
GIS Data Management	All spatial data input to GIS	Maintain existing programme

Marine Tourism

Objectives

- Support the Development of Marine Tourism initiatives within the Foyle and Carlingford Areas
 - Provide supporting science
 - Review IBIS projects and implement findings where appropriate
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access

Policy context

- Habitats Directive
- MSFD
- NI Biodiversity Strategy
- Loughs Agency Biodiversity Strategy
- Loughs Agency Development Strategic Plan
- Loughs Agency Legislation



The following table outlines the current status of the Loughs Agency scientific monitoring with regards to Marine Tourism and species of conservation and biodiversity interest and future requirements.

Table 9. Data / Activity for Marine Tourism

Data / Activity	Current Status	Future Requirement
Cetacean monitoring	Ongoing IBIS project	Seek external funding to continue
Elasmobranch monitoring	Ongoing QUB and NPWS project	Seek external funding to continue

Habitat Quality

Objectives

- Support the maintenance and improvement of habitat quality
 - Provide supporting science
 - Review IBIS projects and implement findings where appropriate
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access

Policy context

- Water Framework Directive
- Habitats Directive
- MSFD
- NI Biodiversity Strategy
- Loughs Agency Biodiversity Strategy
- Loughs Agency Development Strategic Plan
- Loughs Agency Legislation

The following table outlines the current status of the Loughs Agency scientific monitoring with regards to Habitat Quality and future requirements.

Table 10. Data / Activity for Habitat Quality

Data / Activity	Current Status	Future Requirement
HIB's	Ongoing surveys	Maintain existing programme
Habitat improvement schemes – freshwater and marine	Ongoing	Maintain existing programmes
IBIS	Field work complete, writing up ongoing	Review and implement findings where appropriate
GIS Data Management	All spatial organised data input to GIS	Maintain existing programme and seek to expand real time data collection and management
Section 46/47 permit	Ongoing	Maintain existing programme
Reporting of key statistics	Annually ongoing	Maintain existing programme

Water Quality

Objectives

- Support the maintenance and improvement of water quality
 - Provide supporting science
 - Review IBIS projects and implement findings where appropriate
 - All spatial data to be managed with Geographical Information Systems (GIS), expand real time data collection and management. Develop internal and external access

Policy context

- Water Framework Directive
- Habitats Directive
- MSFD
- NI Biodiversity Strategy
- Loughs Agency Biodiversity Strategy
- Loughs Agency Development Strategic Plan
- Loughs Agency Legislation

The following table outlines the current status of the Loughs Agency scientific monitoring with regards to Water Quality and future requirements.

Table 11. Data / Activity for Water Quality

Data / Activity	Current Status	Future Requirement
Macroinvertebrate monitoring	80 sites bi-annually	Maintain existing programme
Water chemistry	80 sites monthly during summer field season	Maintain existing programme
Freshwater Environmental Monitoring Systems		Maintain existing programme
Catchment Status Reports	2 annual reports	Maintain existing programme
Water Quality Status Reports	2 annual reports	Maintain existing programme
IBIS	Field work complete, writing up ongoing	Review and implement findings where appropriate
GIS Data Management	All spatial organised data input to GIS	Maintain existing programme and seek to expand real time data collection and management
HIB's	Ongoing surveys	Maintain existing programme
Reporting of key statistics	Annually ongoing	Maintain existing programme

Existing Research

The Loughs Agency with partners in the University of Glasgow and QUB were successful in securing INTERREG IVA funds to undertake the IBIS research and training programme between December 2011 and June 2015. The following is a list of the topics studied. These will be reviewed over the lifetime of the strategy and findings implemented where appropriate.

Table 12. IBIS PhD level research projects

Title
The population dynamics and migration of the European eel (<i>Anguilla Anguilla</i>)
The impacts of small scale hydropower schemes upon aquatic communities
The effects of Marine Protected Areas on animal populations, biodiversity and fisheries
Phenotypic and genetic structuring in Brown trout (<i>Salmo trutta</i>) populations
Modelling the early life stages of Atlantic salmon (<i>Salmo salar</i>) to improve conservation limit estimations
The ecology underpinning conservation management of rare freshwater fishes
Piscivory in ferox trout (<i>Salmo trutta</i>)
The effect of in-stream barriers on the river migration of Atlantic salmon (<i>Salmo salar</i>)
Seabirds as monitors of shallow coastal habitats
Life history strategies in the sea-trout (<i>Salmo trutta</i>)
Developing science-based management strategies for environmental and commercial sustainability of native oysters (<i>Ostrea edulis</i>) research
Developing science-based management strategies for improving yield of blue mussels (<i>Mytilis edulis</i>) in benthic cultivation
Developing best practice for <i>Ostrea.edulis</i> fisheries production in Loch Ryan
Predicting impacts of near-future climate change on shellfish stock management
Developing genomic tools for application in the management of exploited stocks of the European oyster (<i>Ostrea edulis</i>)
Impacts of the natural spread of non-native oysters and interactions with native oysters
Sympatric Phenotypic Polymorphism in the brown Trout (<i>Salmo trutta</i>)
The marine acoustic environment and megafauna around the coast of the Inishowen Peninsula

Table 13. IBIS Masters level research projects

The use of the River Invertebrate Classification Tool (RICT) in the Foyle and Carlingford Catchments, its application in management and the link between biotic index scores and fish density grades research page
The porosity of river barriers and the cumulative impediment to the migration of Atlantic Salmon (<i>Salmo salar</i>) in the Foyle River catchment research page
Conservation ecology of the freshwater pearl mussel (<i>Margaritifera margaritifera</i>)
The impact of predation on the Atlantic Salmon (<i>Salmo salar</i>) and Brown Trout (<i>Salmo trutta</i>) stocks of the Lough Foyle catchment - a bioenergetics modelling application research page
The use of non-invasive sampling methods for the detection of (<i>Anguillicola crassus</i>) a swimbladder parasite of the European Eel (<i>Anguilla anguilla</i>), and an investigation into the morphological changes associated with swimbladder infection
Conservations limits & Atlantic Salmon (<i>Salmo salar</i>)
Methods for monitoring seabirds research page
Assessment of the impact of biocides on the American Signal Crayfish (<i>Pacifastacus leniusculus</i>) to aid eradication in Scotland
Interactions between shorebirds and aquaculture in Carlingford Lough
Aquaculture vs. other anthropogenic disturbances: the effects on water birds on Carlingford Lough
Developing best practices for <i>Crassostrea.gigas</i> producers
The importance of size-fecundity relationships in the management of the European Lobster (<i>Homarus gammarus</i>)
Effect of infection with the swim bladder parasite (<i>Anguillicola crassus</i>) on lipid content of European eel (<i>Anguilla anguilla</i>)
Governance of the Marine Environment Around the Island of Ireland

Factors influencing fecundity in the European Eel (<i>Anguilla anguilla</i>)
Operating costs in the Lough Foyle oyster fishery.
Interactions between shellfish fisheries and wildfowl on Lough Foyle research page
Assessment of cormorant predation on Atlantic salmon (<i>Salmo salar</i>) smolts on the Foyle catchment
Potential benefits and applications of thermal effluents in aquaculture
Assessment of production grow out strategies for commercial development of European Perch (<i>Perca fluviatilis</i>)
Impact assessment of anthropogenic mediated habitat alteration on the genetic structure of the Lough Derg brown trout (<i>Salmo trutta</i>) population

Conclusion

The Loughs Agency is committed to using the best available information generated through ongoing core science programmes and projects such as IBIS to support management and policy decisions. Action Plans will be developed over the life time of the Plan to ensure co-ordinated delivery and a mechanism for dissemination of these data in the Agency and to the wider stakeholder community. The Agency is keen to engage with stakeholders and views the Strategic Plan as a means of continued facilitation and strengthening of linkages between statutory organisations in both jurisdictions.